1

Yellow

A seal swims toward an inlet with a speed of 5.0 m/s as a current of 1.0 m/s flows in the opposite direction. How long will it take the seal to swim 100. m?

2

Lynn is driving home from work and finds that there is road construction being done on her favorite route, so she must take a detour. Lynn travels 5 km north, 6 km east, 3 km south, 4 km west, and 2 km south. a) Draw a vector diagram of the situation. b) What is her displacement? Solve graphically. c) What total distance has Lynn covered?

3

Avery sees a UFO out her bedroom window and calls to report it to the police. She says, "The UFO moved 20.0 m east, 10.0 m north, and 30.0 m west before it disappeared." What was the displacement of the UFO while Avery was watching? Solve graphically.

4

Veronica can swim 3.0 m/s in still water. While trying to swim directly across a river from west to east, Veronica is pulled by a current flowing southward at 2.0 m/s. a) What is the magnitude of Veronica's resultant velocity? b) If Veronica wants to end up exactly across stream from where she began, at what angle to the shore must she swim upstream?

5

Yellow

Shareen finds that when she drives her motorboat upstream she can travel with a speed of only 8 m/s, while she moves with a speed of 12 m/s when she heads downstream. What is the current of the river on which Shareen is traveling?

6

In Moncton, New Brunswick, each high tide in the Bay of Fundy produces a large surge of water known as a tidal bore. If a riverbed fills with this flowing water that travels north with a speed of 1.0 m/s, what is the resultant velocity of a puffin who tries to swim east across the tidal bore with a speed of 4.0 m/s?

7

Eli finds a map for a buried treasure. It tells him to begin at the old oak and walk 21 paces due west, 41 paces at an angle 45° south of west, 69 paces due north, 20 paces due east, and 50 paces at an angle of 53° south of east. How far from the oak tree is the buried treasure? Solve graphically.

8

A flock of Canada geese is flying south for the winter. On the first day the geese fly due south a distance of 800. km. On the second day they fly back north 100. km and pause for a couple of days to graze on a sod farm. The last day the geese continue their journey due south, covering a distance of 750. km. a) Draw a vector diagram of the journey and find the total displacement of the geese during this time. b) How does this value differ from the total distance traveled?

BLUE

Mubarak jumps and shoots a field goal from the far end of the court into the basket at the other end, a distance of 27.6 m. The ball is given an initial velocity of 17.1 m/s at an angle of 40.0° to the horizontal from a height of 2.00 m above the ground. What is its velocity as it hits the basket 3.00 m off the ground?

Drew claims that he can throw a dart at a dartboard from a distance of 2.0 m and hit the 5.0-cm-wide bulls-eye if he throws the dart horizontally with a speed of 15 m/s. He starts the throw at the same height as the top of the bulls-eye. See if Drew is able to hit the bulls-eye by calculating how far his shot falls from the bulls-eye's lower edge.

Billy-Joe stands on the Talahatchee Bridge kicking stones into the water below. a) If Billy-Joe kicks a stone with a horizontal velocity of 3.50 m/s, and it lands in the water a horizontal distance of 5.40 m from where Billy-Joe is standing, what is the height of the bridge? b) If the stone had been kicked harder, how would this affect the time it would take to fall?

15] PINK

On May 20, 1999, 37-year old Robbie Knievel, son of famed daredevil Evel Knievel, successfully jumped 69.5 m over a Grand Canyon gorge. Assuming that he started and landed at the same level and was airborne for 3.66 s, what height from his starting point did this daredevil achieve?

16]

Bert is standing on a ladder picking apples in his grandfather's orchard. As he pulls each apple off the tree, he tosses it into a basket that sits on the ground 3.0 m below at a horizontal distance of 2.0 m from Bert. How fast must Bert throw the apples (horizontally) in order for them to land in the basket?

17]

The Essex county sheriff is trying to determine the speed of a car that slid off a small bridge on a snowy New England night and landed in a snow pile 4.00 m below the level of the road. The tire tracks in the snow show that the car landed 12.0 m measured horizontally from the bridge. How fast was the car going when it left the road?

18]

Superman is said to be able to "leap tall buildings in a single bound." How high a building could Superman jump over if he were to leave the ground with a speed of 60.0 m/s at an angle of 75.0° to the horizontal?

19] Pink

Len is running to school and leaping over puddles as he goes. From the edge of a 1.5-m-long puddle, Len jumps 0.20 m high off the ground with a horizontal velocity component of 3.0 m/s in an attempt to clear it. Determine whether or not Len sits in school all day with wet socks on.

20]

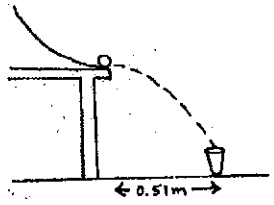
At a meeting of physics teachers in Montana, the teachers were asked to calculate where a flour sack would land if dropped from a moving airplane. The plane would be moving horizontally at a constant speed of 60.0 m/s at an altitude of 300. m. a) If one of the physics teachers neglected air resistance while making his calculation, how far horizontally from the dropping point would he predict the landing? b) Draw a sketch that shows the path the flour sack would take as it falls to the ground (from the perspective of an observer on the ground and off to the side.)

21]

Tad drops a cherry pit out the car window 1.0 m above the ground while traveling down the road at 18 m/s. a) How far, horizontally, from the initial dropping point will the pit hit the ground? b) Draw a picture of the situation. c) If the car continues to travel at the same speed, where will the car be in relation to the pit when it lands?

23]

In her physics lab, Melanie rolls a 10-g marble down a ramp and off the table with a horizontal velocity of 1.2 m/s. The marble falls in a cup placed 0.51 m from the table's edge. How high is the table?



PINK

24

The movie "The Gods Must Be Crazy" begins with a pilot dropping a bottle out of an airplane. It is recovered by a surprised native below, who thinks it is a message from the gods. If the plane from which the bottle was dropped was flying at an altitude of 500. m, and the bottle lands 400. m horizontally from the initial dropping point, how fast was the plane flying when the bottle was released?

25

In many locations, old abandoned stone quarries have become filled with water once excavating has been completed. While standing on a 10.0-m-high quarry wall, Clarence tosses a piece of granite into the water below. If Clarence throws the rock horizontally with a velocity of 3.0 m/s, how far out from the edge of the cliff will it hit the water?

26

While skiing, Ellen encounters an unexpected icy bump, which she leaves horizontally at 12.0 m/s. How far out, horizontally, from her starting point will Ellen land if she drops a distance of 7.00 m in the fall?

27

Orange

The Maton family begins a vacation trip by driving 700 km west. Then the family drives 600 km south, 300 km east, and 400 north. Where will the Matons end up in relation to their starting point? Solve graphically.

28

In the record books, there are men who claim that they have such strong teeth that they can even use them to move cars, trains, and helicopters. Joe Ponder of Love Valley, North Carolina is one such man. Suppose a car pulling forward with a force of 20 000 N was pulled back by a rope that Joe held in his teeth. Joe pulled the car with a force of 25 000 N. Draw a vector diagram of the situation and find the resultant force.

29

If St. Louis Cardinals homerun king, Mark McGwire, hit a baseball due west with a speed of 50.0 m/s, and the ball encountered a wind that blew it north at 5.00 m/s, what was the resultant velocity of the baseball?

30

Esther dives off the 3-m springboard and initially bounces up with a velocity of 8.0 m/s at an angle of 80.° to the horizontal. What are the horizontal and vertical components of her velocity?

31 Orange

Dwight pulls his sister in her wagon with a force of 65 N at an angle of 50.0° to the vertical. What are the horizontal and vertical components of the force exerted by Dwight?

32

Ivan pulls a sled loaded with logs to his cabin in the woods. If Ivan pulls with a force of 800. N in a direction 20.0° above the horizontal, what are the horizontal and vertical components of the force exerted by Ivan?

33

Marcie shovels snow after a storm by exerting a force of 30.0 N on her shovel at an angle of 60.0° to the vertical. What are the horizontal and vertical components of the force exerted by Marcie?

34

Erica and Tory are out fishing on the lake on a hot summer day when they both decide to go for a swim. Erica dives off the front of the boat with a force of 45 N, while Tory dives off the back with a force of 60. N. a) Draw a vector diagram of the situation. b) Find the resultant force on the boat.

35

Orange

Young thoroughbreds are sometimes reluctant to enter the starting gate for their first race. Astro Turf is one such horse, and it takes two strong men to get him set for the race. Derek pulls Astro Turf's bridle from the front with a force of 200. N and Dan pushes him from behind with a force of 150. N, while the horse pushes back against the ground with a force of 300. N. a) Draw a vector diagram of the situation. b) What is the resultant force on Astro Turf?

36

Every March, the swallows return to San Juan Capistrano, California after their winter in the south. If the swallows fly due north and cover 200 km on the first day, 300 km on the second day, and 250 km on the third day, draw a vector diagram of their trip and find their total displacement for the three-day journey.